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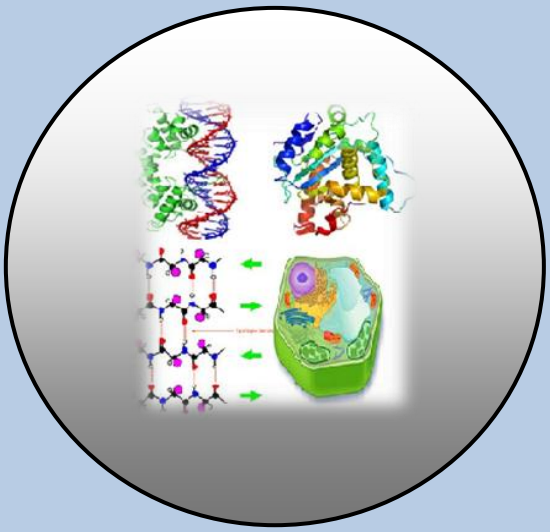

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RESEARCH PAPER
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*Curcuma longa: A*ntibacterial Potential of *Leaf extract* against *Xanthomonas campestris* pv. *Mangiferae indicae*

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ABSTRACT

Mango bacterial canker disease (MBCD) caused by Xanthomonas campestris pv. Mangiferae indicae (Xcmi) is one of the important diseases of mango affecting a number of commercial cultivars. The pathogen affects different plant parts like leaf, stem and fruit. Favorable environmental conditions cause severe loss to the crop. Leaf extract of 37 plants were tested against Xcmi; out of them, leaf extract of Curcuma longa L. gave promising results. Hence, fresh leaf extracts of C. longa were screened for its antibacterial activity against 25 strains of Xcmi collected from different parts of Maharashtra. The in vitro studies have been performed by using cup-plate method to examine the activity. Cup cavity filled with sterile distilled water was used as control in all the experiments. All experiments were repeated for four times (Experiment A, B, C & D). The maximum activity was recorded against Xcmi.04 (Mean activity zone – 20.79 mm) followed by Xcmi.20 (Mean activity zone – 20.73 mm) and comparatively minimum activity was recorded against Xcmi.12 (Mean activity zone – 17.44 mm). The ultimate aim of the research work was to develop economically and technically viable field formulations for the farmers, which will be Bio-ecologically compatible for management of plant bacterial diseases.
Key Words: Antibacterial potential, Xanthomonas campestris pv. Mangiferae indicae, and Curcuma longa.

INTRODUCTION

Bacterial diseases of fruit plants are known to cause great damages all over the world. Mango (*Mangifera indica* L.) is the most ancient among the tropical fruits. Among the

bacterial diseases, bacterial canker is the most severe disease on Mango, which is caused by *Xanthomonas campestris* pv. *Mangiferae indicae* (*Xcmi*). The pathogen affects different plant parts like leaf, stem and fruit. Favorable environmental conditions cause severe loss to the crop. Fruit cracking due to the disease causes extensive loss to the cultivator.

For the management plant diseases, various chemicals are used since last several years, the world over. They tend to accumulate in animal tissues posing threat to human health. Green plants represent a reservoir of effective chemo-therapeutants and can provide valuable sources of natural pesticides (Balandrin *et al*, 1985; Hostettmann and Wolfender, 1997). Medicinal properties of leaf extracts have been reported by many workers (Mishra, 1996; Naik, 1998; Suhaila *et al,* 1996). The medicinal properties of leaf extracts have also been mentioned by Kirtikar and Basu (1991).

Curcuma longa (*Zingiberaceae*) is an import spice ingredient of Indian food which is also a major export and economic source of foreign exchange. *C. longa* is also having many traditional and herbal medicinal uses having Curcuminoids and volatile oils (Yasodamma *et al*, 2013). Herbs and spices have been the most valuable treasure in India. Turmeric is one of the important spices. Plants have always been a rich source of biochemical compound. Many of these chemical compounds are useful drugs in themselves but safe to use because it is not harmful to human (Ody, 1993). Antibacterial activity of 37 medicinal plants were assessed against *Xcmi* strains and observed that activity of *C. longa* (Turmeric) showed better activity. Jabeen *et al*, (2011) reported that Curcumin was supposed to be isolated from *C. longa* rhizome, which is exhibits maximum inhibitory action against bacterium (Inhibition Zone of 28.45mm in diameter). Thabile (2008) reported antimicrobial properties of Turmeric (*C. longa*) and Lemongrass (*Cymbopogon citratus*).

However, during this research work antibacterial activity of leaf extract of *C. longa* has been assessed against 25 strains of *Xcmi* to observe the behavior of these strains.

MATERIAL AND METHODS

The strains of causal organism of MBCD i.e. *Xcmi* were collected from various districts of Maharashtra. Diseased Mango samples were collected and brought to the laboratory for further investigation. Studies were performed using these samples and maintained various 25 *Xcmi* strains on Nutrient Agar (NA) medium.

a) Preparation of leaf extract: The leaves of the plants were collected, thoroughly washed with tap water and then rinsed with sterile distilled water. For the study, leaf extract was used. They were dried in shade until moisture evaporated. These leaves were powdered by using electric grinder and packed into polythene bags. One gm of the powder was taken and added to 10 ml of sterile distilled water. Then it was subjected to ultracentrifuge for 20 min at -4^{o}C at the 11000 rpm Pawar and Papdiwal (2010).

b) Cup Plate Method: It is a method of testing antibacterial activity. For this, the bacterial suspension was prepared by adding 10 ml sterile distilled water to 2 days old NA slope culture. Five drops of bacterial cell suspension were poured in sterilized petridishes (9 cm diameter) onto which 20 ml of nutrient agar was poured and thoroughly mixed. It was allowed to solidify Pawar and Papdiwal (2012).

In the centre of the medium, a cup cavity of 8 mm diameter was made with sterilized No. 4 cork borer. This cup was filled with 0.1 ml of the leaf extract.

Table 1. Antibacterial Activity of Leaf extract of *Curcuma longa* against *Xcmi* strains.

Sr. No.	Name of the Strain	Zone of Inhibition (in mm)					Remark
		Exp. A	Exp. B	Exp. C	Exp. D	Mean	
1	*Xcmi*.01	17.00	17.25	18.00	17.75	**17.50**	-
2	*Xcmi*.02	18.33	19.33	19.00	19.25	**18.98**	-
3	*Xcmi*.03	19.00	20.00	19.00	19.66	**19.42**	-
4	*Xcmi*.04	21.00	21.00	20.66	20.50	**20.79**	**Max.**
5	*Xcmi*.05	20.25	20.66	20.33	20.75	**20.50**	-
6	*Xcmi*.06	17.00	18.00	17.75	17.66	**17.60**	-
7	*Xcmi-07*	18.33	18.50	18.66	19.00	**18.62**	-
8	*Xcmi*.08	19.33	19.66	19.75	20.00	**19.69**	-
9	*Xcmi*.09	20.75	20.00	20.66	21.00	**20.60**	-
10	*Xcmi*.10	21.00	20.75	20.66	20.33	**20.69**	-
11	*Xcmi*.11	21.00	20.75	20.66	20.00	**20.60**	-
12	*Xcmi*.12	17.00	17.75	17.66	17.33	**17.44**	**Min.**
13	*Xcmi*.13	18.00	17.00	18.25	18.66	**17.98**	-
14	*Xcmi*.14	18.33	18.66	18.75	18.00	**18.44**	-
15	*Xcmi*.15	18.66	18.00	19.00	19.66	**18.83**	-
16	*Xcmi*.16	17.00	17.75	17.66	18.00	**17.60**	-
17	*Xcmi*.17	19.00	19.33	19.66	19.75	**19.44**	-
18	*Xcmi*.18	19.33	19.75	19.66	19.50	**19.56**	-
19	*Xcmi*.19	20.75	20.33	20.75	20.66	**20.62**	-
20	*Xcmi*.20	21.00	20.75	20.66	20.50	**20.73**	**Max. II**
21	*Xcmi*.21	21.00	20.33	20.33	20.75	**20.60**	-
22	*Xcmi*.22	17.50	17.66	18.50	18.00	**17.92**	-
23	*Xcmi*.23	18.75	18.33	18.66	18.25	**18.50**	-
24	*Xcmi*.24	19.66	19.75	19.33	19.25	**19.50**	-
25	*Xcmi*.25	17.00	17.75	18.00	17.66	**17.60**	-
Total		**475.97**	**479.04**	**482.00**	**481.87**	**479.72**	-
Average		**19.04**	**19.16**	**19.28**	**19.27**	**19.19**	-

The petridishes were incubated for 24 hrs at 25±2°C and the observations were recorded as diameter of inhibitory zone in mm. Diameter of the activity zone was measured in 3-4 angles and mean was considered for accuracy. Cup cavity filled with sterile distilled water was used as control in all the experiments. All experiments were repeated for four times (Experiment. A, B, C & D).

RESULT AND DISCUSSION

It is observed from table 01 that *C. longa* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*.04 (Mean activity zone – 20.79 mm) followed by *Xcmi*.20 (Mean activity zone – 20.73 mm) and comparatively minimum activity was recorded against *Xcmi.*12 (Mean activity zone – 17.44 mm) strain under investigation.

Average activity against all *Xcmi* strains was 19.19 mm. Activity of *C. longa* ranges between 17 to 21 mm (Fig.01). Thirteen *Xcmi* strains (*Xcmi*.3, *Xcmi*.4, *Xcmi*.5, *Xcmi*.8, *Xcmi*.9, *Xcmi*.10, *Xcmi*.11, *Xcmi*.17, *Xcmi*.18, *Xcmi*.19, *Xcmi*.20, *Xcmi*.21 and *Xcmi*.24) have showed more activity than average activity of all strains i.e. 19.19 mm; while 12 *Xcmi* strains (*Xcmi*.1, *Xcmi*.2, *Xcmi*.6, *Xcmi*.7, *Xcmi*.12, *Xcmi*.13, *Xcmi*.14, *Xcmi*.15, *Xcmi*.16, *Xcmi*.22, *Xcmi*.23 and *Xcmi*.25) showed less activity than average activity.

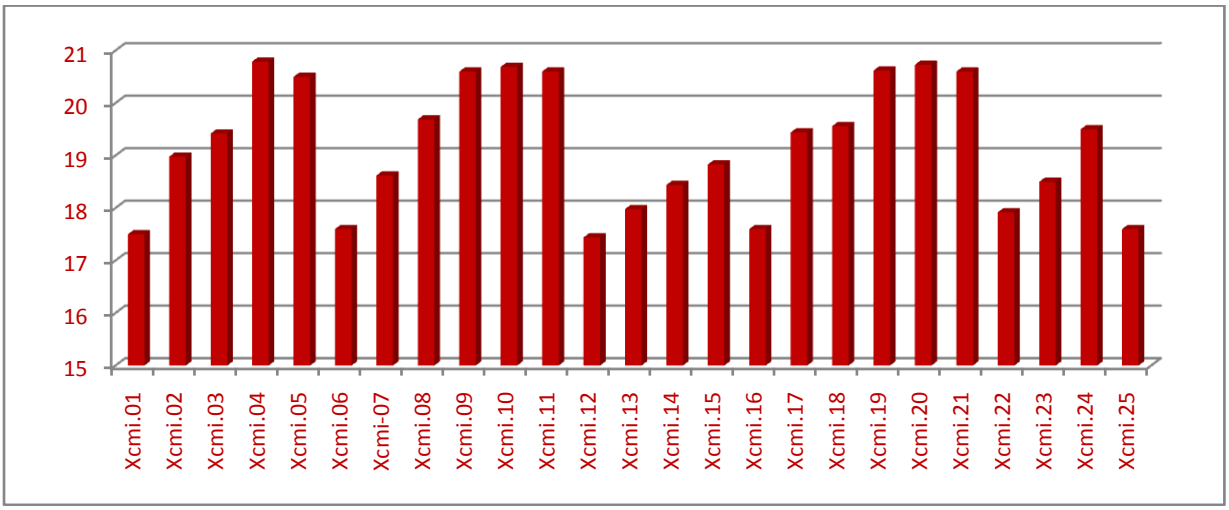

Figure 1. Antibacterial Activity of Leaf extract of *Curcuma longa* against *Xcmi* strains.

Similar results were recorded by Swadhini *et al,* (2011). They evaluated leaves of *Indigofera tinctoria, Polygala elongata, Polygala glabra, Piper nigrum* and *Curcuma longa* and showed a good control on the growth of fungi against *Myrothecium sp*. (Accession no. HM219863). Mari selvam *et al*, (2012) confirmed the antimicrobial activity of turmeric extract against ten different bacterial strains. Ram Kumar and Jain (2010) evaluated six extracts of two spices *viz.* of Black Pepper (*Piper nigrum*) and Turmeric (*Curcuma longa*) for their antibacterial and antifungal activity. During the study of antifungal activity, ethanolic extract of turmeric showed activity against *Rhizopus stolonifer* and *Mucor* sp. with percent mycelial growth inhibition ranged between 25% and 30%. Shawket (2013) screened the antibacterial potency of essential oils of *C. longa* extract against *Staphylococcus* sp.

It was observed from the research work, that leaf extract of *C. longa* is effective against all the strains of *Xcmi*. The leaf extract is eco-friendly, economic and technically viable field formulation, which will be Bio-ecologically compatible for management of various strains of *Xcmi*.

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